Sierra Club Evaluation of Compliance with 1-hour SO_2 NAAQS

for

AmerenUE Meramec Plant – St. Louis, Missouri

Ameren Labadie Plant – Labadie, Missouri

AmerenUE Rush Island Plant – Festus, Missouri

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1. Introduction

The Sierra Club prepared an air modeling impact analysis to help USEPA, state and local air agencies identify facilities that are likely causing violations of the one-hour sulfur dioxide (SO_2) national ambient air quality standard (NAAQS). This document describes the results and procedures for an evaluation conducted for the following power plants:

- AmerenUE Meramec Plant – St. Louis, Missouri
- Ameren Labadie Plant – Labadie, Missouri
- AmerenUE Rush Island Plant – Festus, Missouri

The dispersion modeling analysis predicted ambient air concentrations for comparison with the one-hour SO_2 NAAQS. The modeling was performed using data provided to the Sierra Club by regulatory air agencies and through other common sources described below.

2. Compliance with the One-Hour SO_2 NAAQS

2.1 One-Hour SO_2 NAAQS

The one-hour SO_2 NAAQS takes the form of a three-year average of the 99th-percentile of the annual distribution of daily maximum one-hour concentrations, which cannot exceed 75 ppb.[1] Compliance with this standard was verified using USEPA's AERMOD air dispersion model, which produces air concentrations in units of µg/m^3. The one-hour SO_2 NAAQS of 75 ppb equals 196.2 µg/m^3, and this is the value used for determining whether modeled impacts exceed the NAAQS.[2] The 99th-percentile of the annual distribution of daily maximum one-hour concentrations corresponds to the fourth-highest value at each receptor for a given year.

2.2 Modeling Results

Modeling results are summarized in Table 1. It was determined that based on either current allowable emissions or measured actual emissions, each of the three power plants is estimated to create downwind SO_2 concentrations which exceed the 1-hour NAAQS.

For the modeling results presented in Table 1, the evaluated emission rates include the allowable and maximum. "Allowable" is the peak emission rate from each unit as approved by the current air

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[1] USEPA, Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard, August 23, 2010.
[2] The ppb to µg/m^3 conversion is found in the source code to AERMOD v. 11353, subroutine Modules. The conversion calculation is 75/0.3823 = 196.2 µg/m^3.

quality operation permit for the facility. "Maximum" is the highest combined emission rate from all units at a facility during any single hour as measured during the 2008 to 2010 period.

The currently permitted emissions and measured actual emissions used for the modeling analysis for each of the three power plants are summarized in Tables 2, 3 and 4. Based on the modeling results, emission reductions from current rates considered necessary to achieve compliance with the 1-hour NAAQS were calculated and presented in Table 5.

All three power plants were predicted to cause exceedences of the 1-hour NAAQS for SO_2 which extend throughout Missouri to a maximum distance of 50 kilometers. Exceedences are also predicted to occur in the adjacent state of Illinois.

Supporting figures are provided in the following appendices to show the extent of the NAAQS violations:

Appendix A - Meramec Plant
Appendix B - Labadie Plant
Appendix C - Rush Island Plant

For each plant, Figure 1 shows the extent of NAAQS violations throughout the entire 50 kilometer modeling domain. Figure 2 provides a close-up local view of NAAQS violations.

Air quality impacts are based on a background concentration of 117.7 $\mu g/m^3$. This is the 2008-10 design value for the ambient monitor located in the city of St. Louis. This is the lowest measured background concentration in the state and so may under-predict compliance with the NAAQS.

2.3 Conservative Modeling Assumptions

A dispersion modeling analysis requires the selection of numerous parameters which affect the predicted concentrations. For the enclosed analysis, several parameters were selected which under-predict facility impacts.

Assumptions used in this modeling analysis which likely under-estimate concentrations include the following:

- Allowable emissions are based a limitation with longer averaging periods than the air quality standard. If the applicable averaging period is greater than a 1-hour average, then emissions during any 1-hour period may be higher than assumed for the modeling analysis.
- No consideration of facility operation at less than 100% load. Stack parameters such as exit flow rate and temperature are typically lower at less than full load, reducing pollutant dispersion and increasing predicted air quality impacts.

- No consideration of building or structure downwash. These downwash effects typically increase predicted concentrations near the facility.
- No consideration of off-site sources. Each of power plant was modeled separately so the combined impacts are not considered. If the power plants were modeled simultaneously or with other sources of SO_2, this will increase the predicted impacts.

Table 1 - SO_2 Modeling Results for the Modeling Analysis

Location	Emission Rates	Averaging Period	99th Percentile 1-hour Daily Maximum (µg/m3)				Complies with NAAQS?
			Impact	Background	Total	NAAQS	
Meramec Plant	Allowable	1-hour	1,519.9	117.7	1,637.6	196.2	No
	Maximum	1-hour	713.6	117.7	831.3	196.2	No
Labadie Plant	Allowable	1-hour	2,046.4	117.7	2,164.1	196.2	No
	Maximum	1-hour	425.4	117.7	543.1	196.2	No
Rush Island Plant	Allowable	1-hour	420.4	117.7	538.1	196.2	No
	Maximum	1-hour	329.9	117.7	447.6	196.2	No

Table 2 - Modeled SO_2 Emissions for the Meramec Plant

Stack	Boiler	Allowable Emissions[3] 3-hour Average (lbs/hr)	Maximum Emissions[4] 1-hour Average (lbs/hr)
S01	EU0010	3,601.8	1,549.1
S02	EU0020	3,601.8	1,618.8
S03	EU0030	7,295.6	3,915.3
S04	EU0040	8,698.6	6,029.2
Total	-	23,197.8	13,112.4

[3] Allowable emissions are based on the 2.3 lbs/mmbtu limitation in Title V Permit to Operate No. OP2009-017 issued by the Missouri Department of Natural Resources on July 13, 2009.

[4] Maximum emissions are based on measured hourly rates reported during the 2008 to 2010 period in USEPA, Clean Air Markets - Data and Maps.

Table 3 - Modeled SO_2 Emissions for the Labadie Plant

Stack	Boiler	Allowable Emissions[5] 24-hour Average (lbs/hr)	Maximum Emissions[6] 1-hour Average (lbs/hr)
S01	B1	29,678.4	5,703.5
S02	B2	29,678.4	6,101.6
S03	B3	29,313.6	6,295.3
S04	B4	29,313.6	6,557.7
Total	-	117,984.0	24,658.1

Table 4 - Modeled SO_2 Emissions for the Rush Island Plant

Stack	Boiler	Allowable Emissions[7] 3-hour Average (lbs/hr)	Maximum Emissions[8] 1-hour Average (lbs/hr)
S01	B-1	13,620.6	10,589.7
S02	B-2	13,620.6	10,787.1
Total	-	27,241.2	21,376.8

Table 5 - Required Emission Reductions for Compliance with 1-hour SO_2 NAAQS

Power Plant	Acceptable Impact (NAAQS - Background) 99th Percentile 1-hour Daily Max ($\mu g/m^3$)	Required Total Facility Maximum Emission Reduction (%)	Required Total Facility Maximum Emission Rate (lbs/hr)
Meramec Plant	78.5	94.8	1,198.1
Labadie Plant	78.5	96.2	4,525.9
Rush Island Plant	78.5	81.3	5,086.7

[5] Allowable emissions are based on the 4.8 lbs/mmbtu limitation in Title V Permit to Operate No. OP2011-020 issued by the Missouri Department of Natural Resources on May 9, 2011.
[6] Maximum emissions are based on measured hourly rates reported during the 2008 to 2010 period in USEPA, Clean Air Markets - Data and Maps.
[7] Allowable emissions are based on the 2.3 lbs/mmbtu limitation in Title V Permit to Operate No. OP2010-047 issued by the Missouri Department of Natural Resources on August 30, 2010.
[8] Maximum emissions are based on measured hourly rates reported during the 2008 to 2010 period in USEPA, Clean Air Markets - Data and Maps.

3. Modeling Methodology

3.1 Air Dispersion Model

The modeling analysis used USEPA's AERMOD program, version 11353. AERMOD, as available from the Support Center for Regulatory Atmospheric Modeling (SCRAM) website, was used in conjunction with a third-party modeling software program, *AERMOD View*, sold by Lakes Environmental Software.

3.2 Control Options

The AERMOD model was run with the following control options:

- One-hour average air concentrations
- Regulatory defaults
- Flagpole receptors

To reflect a representative inhalation level, a flagpole height of 1.5 meters was used for all modeled receptors. This parameter was added to the receptor file when running AERMAP, as described in Section 4.4.

An evaluation was conducted to determine if each modeled facility was located in a rural or urban setting using USEPA's methodology outlined in Section 7.2.3 of the Guideline on Air Quality Models.[9] For urban sources, the URBANOPT option is used in conjunction with the urban population from an appropriate nearby city and a default surface roughness of 1.0 meter. Methods described in Section 4.1 to determine whether rural or urban dispersion coefficients were used.

3.3 Output Options

The AERMOD analysis was based on five years of recent meteorological data. The modeling analyses used one run with five years of sequential meteorological data from 2006-2010. Consistent with USEPA's Modeling Guidance for SO_2 NAAQS Designations, AERMOD provided the fourth-high one-hour SO_2 impacts.[10] This provided a file of one-hour SO_2 concentrations consistent with the form of the one-hour SO_2 NAAQS. It is from these files that the maximum one-hour SO_2 value was determined and reported.

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[9] USEPA, Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions, Appendix W to 40 CFR Part 51, November 9, 2005.
[10] USEPA, Area Designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standards, Attachment 3, March 24, 2011, pp. 24-26.

Please refer to Table 1 for the modeling results. Please see the supporting figures in the appendices for a presentation of concentration isopleths.

4. Model Inputs

4.1 Geographical Inputs

The "ground floor" of all air dispersion modeling analyses is establishing a coordinate system for identifying the geographical location of emission sources and receptors. These geographical locations are used to determine local characteristics (such as land use and elevation), and also to ascertain source to receptor distances and relationships.

The Universal Transverse Mercator (UTM) NAD83 coordinate system was used for identifying the easting (x) and northing (y) coordinates of the modeled sources and receptors. Stack locations were obtained from facility permits and prior modeling files provided by the Missouri Department of Natural Resources. The stack locations were then verified using aerial photographs.

The facility was evaluated to determine if it should be modeled using the rural or urban dispersion coefficient option in AERMOD. A GIS was used to determine whether rural or urban dispersion coefficients apply to a site. Land use within a three-kilometer radius circle surrounding the facility was considered. USEPA guidance states that urban dispersion coefficients are used if more than 50% of the area within 3 kilometers has urban land uses. Otherwise, rural dispersion coefficients are appropriate.[11]

USEPA's AERSURACE model Version 08009 was used to develop the meteorological data for the modeling analysis. This model was also used to evaluate surrounding land use within 3 kilometers. Based on the output from the AERSURFACE, the surrounding land use consisting of urban land use types (i.e. 21 – Low Intensity Residential, 22 – High Intensity Residential, and 23 – Commercial / Industrial / Transportation) around each of the airports providing surface measurements were as follows:

- AmerenUE Meramec Plant – 41.5%
- Ameren Labadie Plant – 5.5%
- AmerenUE Rush Island Plant - 41.5%

For each of the plants, the urban land use types were less than the 50% value considered appropriate for the use of urban dispersion coefficients. Based on the AERSURFACE analysis, it was concluded

[11] USEPA, Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions, Appendix W to 40 CFR Part 51, November 9, 2005, Section 7.2.3.

that the rural option would be used for the modeling summarized in this report. Please refer to Section 4.5.3 for a discussion of the AERSURFACE analysis.

4.2 Emission Rates and Source Parameters

The modeling analysis only considered SO_2 emissions from each facility. Off-site sources were not considered. Concentrations were predicted for two scenarios shown in Table 2:

1) approved or allowable emissions based on permits issued by the regulatory agency, and

2) measured actual hourly SO_2 emissions obtained from USEPA's Clean Air Markets Database. To assure realistic emission rates were used, emissions from all units at a facility were combined and the hour with the maximum total facility emissions was used to determine the actual emissions.

Stack parameters and emissions used for the modeling analysis for each plant are summarized in Tables 6, 7 and 8.

Table 6 – Stack Parameters and Emissions for the Meramec Plant

Description	Unit 1	Unit 2	Unit 3	Unit 4
X Coord. [m]	732716	732680	732635	732585
Y Coord. [m]	4253776	4253782	4253789	4253798
Base Elevation [m]	127.19	127.08	127.18	127.05
Release Height [m]	76.2	76.2	106.68	106.68
Gas Exit Temperature [°K]	436.483	436.483	447.039	463.15
Gas Exit Velocity [m/s]	24.893	24.893	30.77	31.155
Inside Diameter [m]	3.353	3.353	4.267	4.877
Allowable Emission Rate [g/s]	453.8	453.8	919.2	1096
Maximum Emission Rate [g/s]	195.2	204	493.3	759.7

Table 7 – Stack Parameters and Emissions for the Labadie Plant

Description	Boiler 1	Boiler 2	Boiler 3	Boiler 4
X Coord. [m]	688453	688453	688400	688365
Y Coord. [m]	4270320	4270320	4270399	4270444
Base Elevation [m]	149.02	149.02	149.12	150.1
Release Height [m]	213.36	213.36	213.36	213.36
Gas Exit Temperature [°K]	444.261	444.261	444.261	444.261
Gas Exit Velocity [m/s]	28.042	28.042	28.042	28.042
Inside Diameter [m]	6.248	6.248	8.839	8.839
Allowable Emission Rate [g/s]	3739	3739	3693	3693
Maximum Emission Rate [g/s]	718.6	768.8	793.2	826.3

Table 8 – Stack Parameters and Emissions for the Rush Island Plant

Description	Boiler 1	Boiler 2
X Coord. [m]	739908	739917
Y Coord. [m]	4223882	4223886
Base Elevation [m]	124.83	124.84
Release Height [m]	213.36	213.36
Gas Exit Temperature [°K]	405.372	405.372
Gas Exit Velocity [m/s]	24.993	24.993
Inside Diameter [m]	8.839	8.839
Allowable Emission Rate [g/s]	1716	1716
Maximum Emission Rate [g/s]	1334	1359

The above stack parameters and emissions were obtained from regulatory agency permit files.[12] [13] The analysis was conducted based on 100% operating load using maximum exhaust flow rates and emission rates. Operation at less than full capacity loads was not considered. This assumption tends to under-predict impacts since stack parameters such as exit flow rate and temperature are typically lower at less than full load, reducing pollutant dispersion and increasing predicted air quality impacts. Stack location, height and diameter were verified using aerial photographs, and flue gas flow rate and temperature were verified using combustion calculations.

[12] Missouri Department of Natural Resources, Part 70 Permit to Operate for each plant.

[13] Email from B. Andrews, Missouri Department of Natural Resources, Records Manager to S. Klafka – Wingra Engineering, S.C., OR19456 – Stack Parameters, January 6, 2012. Attached spreadsheet was entitled: OR19456 Stack Parameters EGUs 1-5-2012.xls.

4.3 Building Dimensions and GEP

No building dimensions or prior downwash evaluations were available. Therefore this modeling analysis did not address the effects of downwash which may increase predicted concentrations.

4.4 Receptors

For each of the power plants, three receptor grids were employed:

1. A 100-meter Cartesian receptor grid centered on the station and extending out 5 kilometers.
2. A 500-meter Cartesian receptor grid centered on the station and extending out 10 kilometers.
3. A 1,000-meter Cartesian receptor grid centered on the station and extending out 50 kilometers. 50 kilometers is the maximum distance accepted by USEPA for the use of the AERMOD dispersion model.[14]

A flagpole height of 1.5 meters was used for all these receptors.

Elevations from stacks and receptors were obtained from National Elevation Dataset (NED) GeoTiff data. GeoTiff is a binary file that includes data descriptors and geo-referencing information necessary for extracting terrain elevations. These elevations were extracted from 1 arc-second (30 meter) resolution NED files using USEPA's AERMAP program, v. 11103.

4.5 Meteorological Data

To improve the accuracy of the modeling analysis, recent meteorological data for the 2006 to 2010 period were prepared using the USEPA's program AERMET which creates the model-ready surface and profile data files required by AERMOD. Required data inputs to AERMET included surface meteorological measurements, twice-daily soundings of upper air measurements, and the micrometeorological parameters surface roughness, albedo, and Bowen ratio. One-minute ASOS data were available so USEPA methods were used to reduce calm and missing hours.[15]

This section discusses how the meteorological data was prepared for use in the one-hour SO_2 NAAQS modeling analyses. AERMET v. 11059 was used for these tasks.

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[14] USEPA, Revision to the Guideline on Air Quality Models: Adoption of a Preferred General Purpose (Flat and Complex Terrain) Dispersion Model and Other Revisions, Appendix W to 40 CFR Part 51, Section A.1.(1), November 9, 2005.

[15] USEPA, Area Designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standards, Attachment 3, March 24, 2011, p. 19.

4.5.1 Surface Meteorology

SIntegrated Surface Hourly (ISH) data for the 2006 to 2010 period were obtained from the National Climatic Data Center (NCDC). The ISH surface data was processed through AERMET Stage 1, which performs data extraction and quality control checks. Surface meteorology for each power plant was obtained from the following weather stations:

- Meramec Plant – St. Louis Downtown Airport, Chahokia, IL (22 miles northeast)
- Labadie Plant – Spirit of St. Louis Airport, Chesterfield, MO (22 miles northeast)
- Rush Island Plant – St. Louis Downtown Airport, Chahokia, IL (48 miles northeast)

4.5.2 Upper Air Data

Upper-air data are collected by a "weather balloon" that is released twice per day at selected locations. As the balloon is released, it rises through the atmosphere, and radios the data back to the surface. The measuring and transmitting device is known as either a radiosonde, or rawindsonde. Data collected and radioed back include: air pressure, height, temperature, dew point, wind speed, and wind direction. The upper air data were processed through AERMET Stage 1, which performs data extraction and quality control checks.

For all three power plants, the concurrent 2006 through 2010 upper air data from twice-daily radiosonde measurements were obtained from the most representative location. This location was the same for all three plants and was the Lincoln, Illinois measurement station. These data are in Forecast Systems Laboratory (FSL) format and were downloaded in ASCII text format from NOAA's FSL website.[16] All reporting levels were downloaded and processed with AERMET.

4.5.3 AERSURFACE

AERSURFACE is a non-guideline program that extracts surface roughness, albedo, and daytime Bowen ratio for an area surrounding a given location. AERSURFACE uses land use and land cover (LULC) data in the U.S. Geological Survey's 1992 National Land Cover Dataset to extract the necessary micrometeorological data. LULC data was used for processing meteorological data sets used as input to AERMOD.

AERSURFACE v. 08009 was used to develop surface roughness, albedo, and daytime Bowen ratio values in a region surrounding the meteorological data collection site. AERSURFACE was used to develop surface roughness in a one kilometer radius surrounding the data collection site. Bowen ratio and albedo was developed for a 10 kilometer by 10 kilometer area centered on the

[16] Available at: http://esrl.noaa.gov/raobs/

meteorological data collection site. These micrometeorological data were processed for seasonal periods using 30-degree sectors. Seasonal moisture conditions were considered average with no months with continuous snow cover.

4.5.4 Data Review

Missing meteorological data were not filled as the data file met USEPA's 90% data completeness requirement.[17] The AERMOD output file shows there were 4.6% missing data for the Meramec and Rush Island Plants, and 3.5% at the Labadie Plant.

The representativeness of airport meteorological data is a potential concern in modeling industrial source sites.[18] The surface characteristics of the airport data collection sites and the modeled source locations were compared. The selected meteorological data set for each plant was considered appropriate for its modeling analysis.

5. Background SO_2 Concentrations

Background concentrations were determined consistent with USEPA's Modeling Guidance for SO_2 NAAQS Designations.[19] To preserve the form of the one-hour SO_2 standard, based on the 99th percentile of the annual distribution of daily maximum one-hour concentrations averaged across the number of years modeled, the background fourth-highest daily maximum one-hour SO_2 concentration was added to the modeled fourth-highest daily maximum one-hour SO_2 concentration.[20]

Background concentrations were based on the 2008-10 design value measured by the ambient monitors located in each state where concentrations were predicted.[21]

Air quality impacts are based on a background concentration of 117.7 µg/m^3. This is the 2008-10 design value for the ambient monitor located in the city of St. Louis. This is the lowest measured background concentration in the state and so may under-predict compliance with the NAAQS.

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[17] USEPA, Meteorological Monitoring Guidance for Regulatory Modeling Applications, EPA-454/R-99-05, February 2000, Section 5.3.2, pp. 5-4 to 5-5.
[18] USEPA, AERMOD Implementation Guide, March 19, 2009, pp. 3-4.
[19] USEPA, Area Designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standards, Attachment 3, March 24, 2011, pp. 20-23.
[20] USEPA, Applicability of Appendix W Modeling Guidance for the 1-hour SO_2 National Ambient Air Quality Standard, August 23, 2010, p. 3.
[21] http://www.epa.gov/airtrends/values.html

6. Reporting

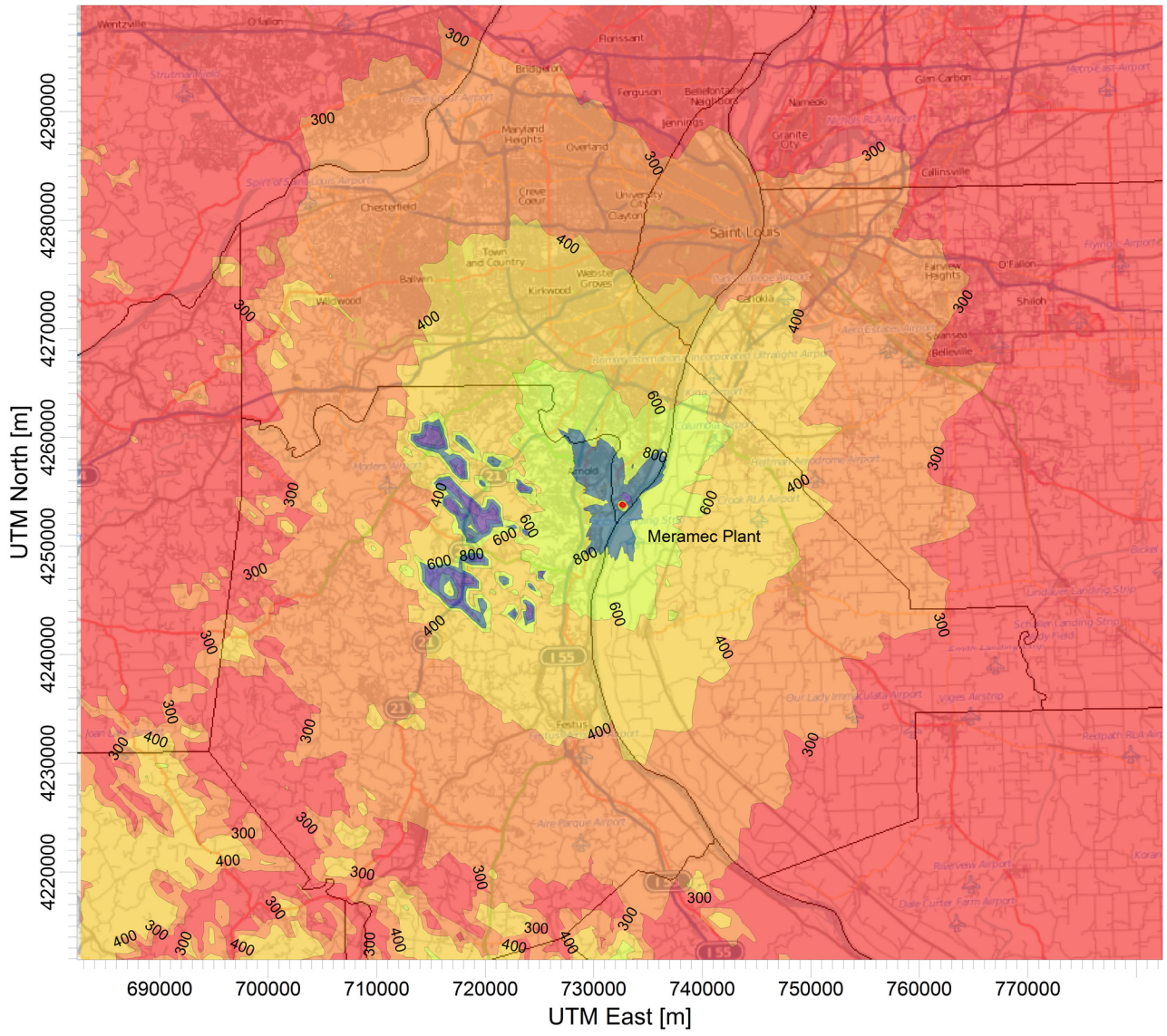
All files from the programs used for this modeling analysis are available to regulatory agencies. These include analyses prepared with AERSURFACE, AERMET, AERMAP, and AERMOD.

Appendix A

Meramec Plant

Supporting Figures

Figure 1 - Regional View - AmerenUE - Meramec Plant - St. Louis, Missouri
Evaluation of Compliance with the 1-hour NAAQS for SO2

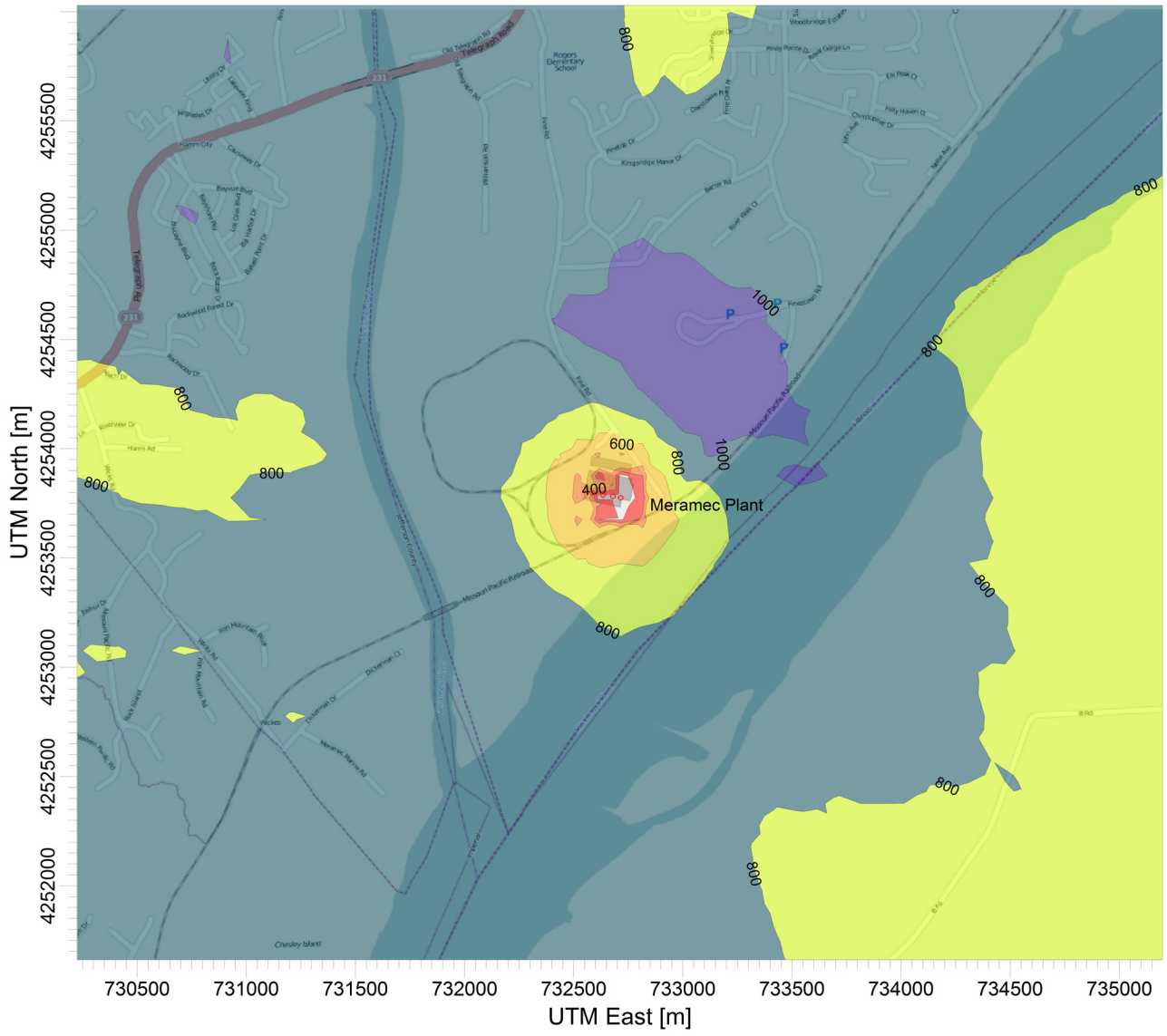


1-hour SO2 Concentrations (ug per cubic meter) - All colored areas exceed the NAAQS.

196 300 400 600 800 1000 1200

All concentrations include a background of 117.7 ug/m3.	Total Sources **8**	**Conducted on behalf of the Sierra Club**
	Total Receptors **22083**	**by Wingra Engineering, S.C.**
	Output Type **Concentration**	SCALE: 1:628,725 0 20 km
	Maximum **1637.61554 ug/m^3**	DATE: **1/9/2012**

Figure 2 - Local View - AmerenUE - Meramec Plant - St. Louis, Missouri
Evaluation of Compliance with the 1-hour NAAQS for SO2



1-hour SO2 Concentrations (ug per cubic meter) - All colored areas exceed the NAAQS.

196 300 400 600 800 1000 1200

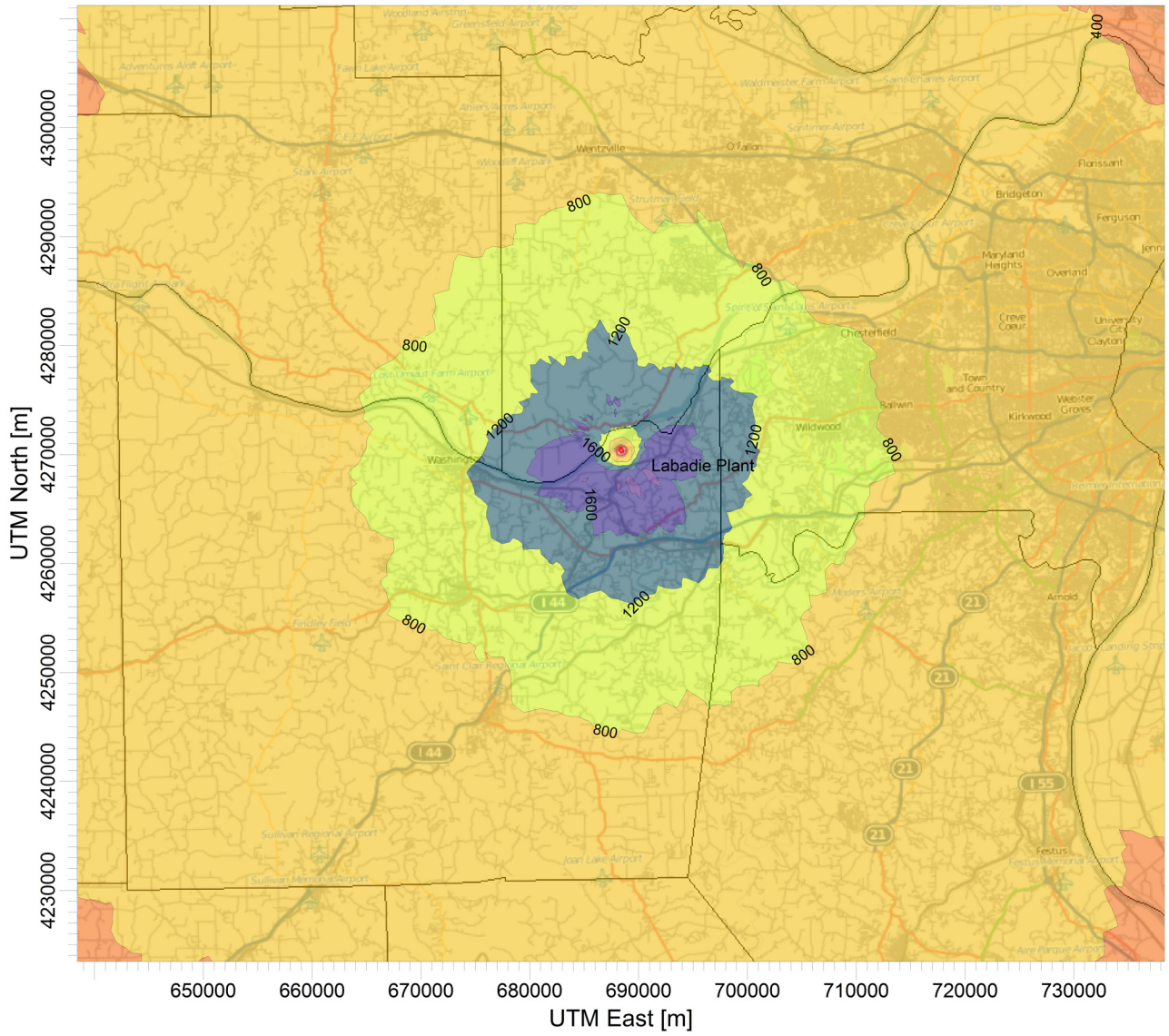
All concentrations include a background of 117.7 ug/m3.	Total Sources **8**	**Conducted on behalf of the Sierra Club**
	Total Receptors **22083**	**by Wingra Engineering, S.C.**
	Output Type **Concentration**	SCALE: 1:31,257 0 1 km
	Maximum **1637.61554 ug/m^3**	DATE: **1/9/2012**

Appendix B

Labadie Plant

Supporting Figures

Figure 1 - Regional View - Ameren Labadie Station - Labadie, Missouri
Evaluation of Compliance with the 1-hour NAAQS for SO2



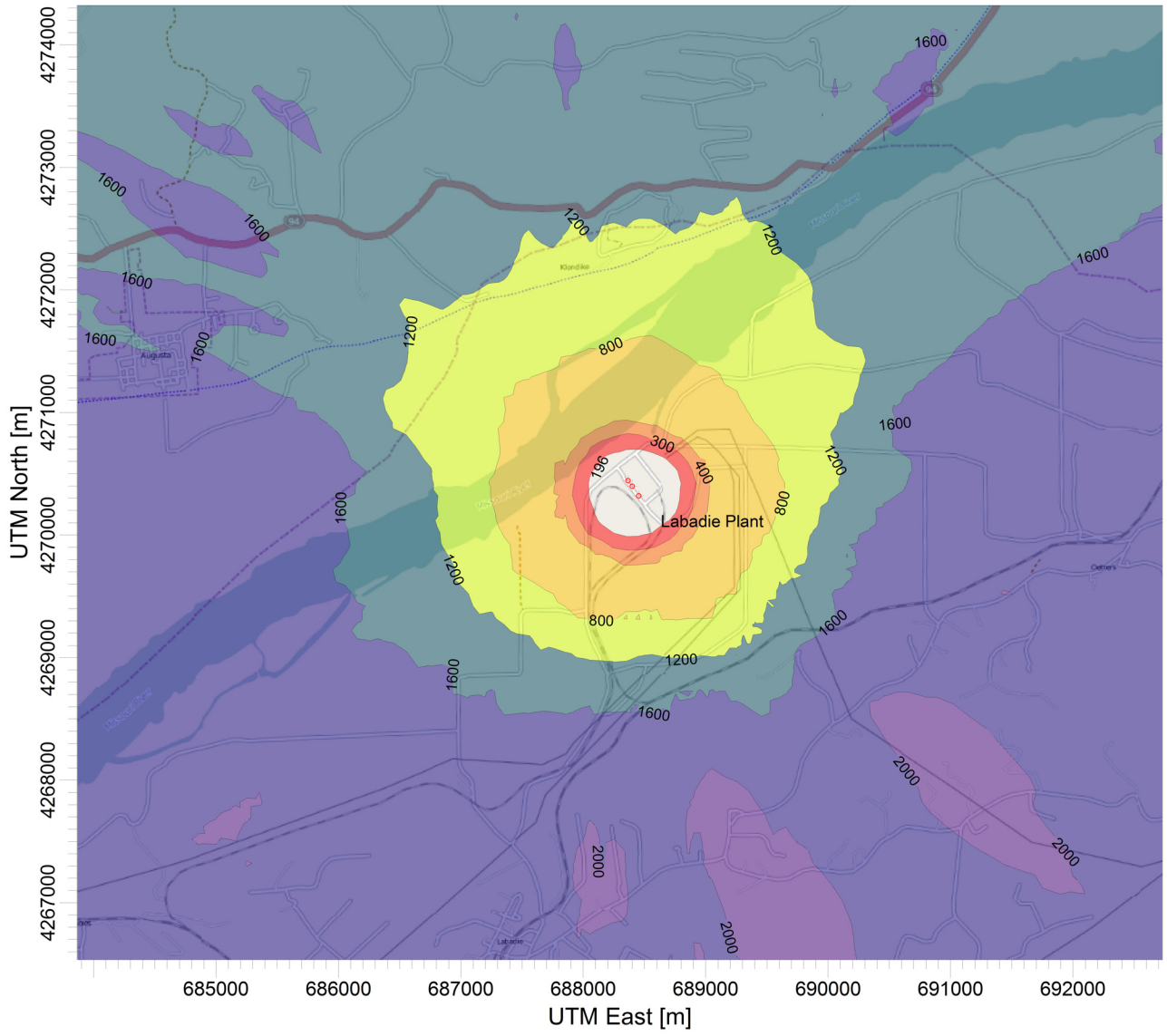
1-hour SO2 Concentrations (ug per cubic meter) - All colored areas exceed the NAAQS.

196 300 400 800 1200 1600 2000

All concentrations include a background of 117.7 ug/m3.

Total Sources **8**	**Conducted on behalf of the Sierra Club**
Total Receptors **22083**	**by Wingra Engineering, S.C.**
Output Type **Concentration**	SCALE: 1:628,073 0 20 km
Maximum **2164.06145 ug/m^3**	DATE: **1/15/2012**

Figure 2 - Local View - Ameren Labadie Station - Labadie, Missouri
Evaluation of Compliance with the 1-hour NAAQS for SO2



1-hour SO2 Concentrations (ug per cubic meter) - All colored areas exceed the NAAQS.

196 300 400 800 1200 1600 2000

All concentrations include a background of 117.7 ug/m3.	Total Sources **8**	**Conducted on behalf of the Sierra Club**
	Total Receptors **22083**	**by Wingra Engineering, S.C.**
	Output Type **Concentration**	SCALE: 1:55,731 0 2 km
	Maximum **2164.06145 ug/m^3**	DATE: **1/15/2012**

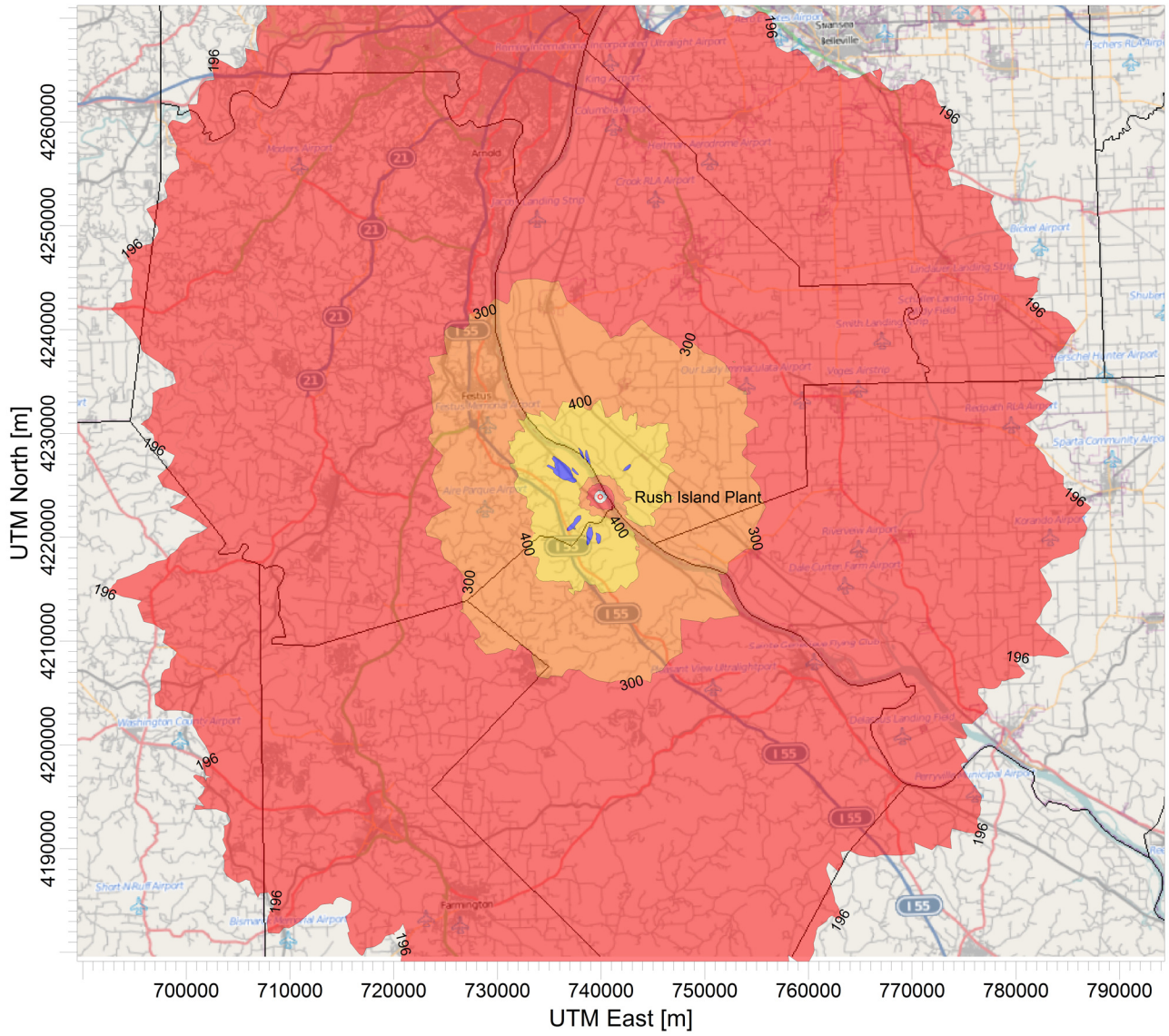
AERMOD View - Lakes Environmental Software

Appendix C

Rush Island Plant

Supporting Figures

Figure 1 - Regional View - AmerenUE Rush Island Plant - Festus, Missouri
Evaluation of Compliance with the 1-hour NAAQS for SO2



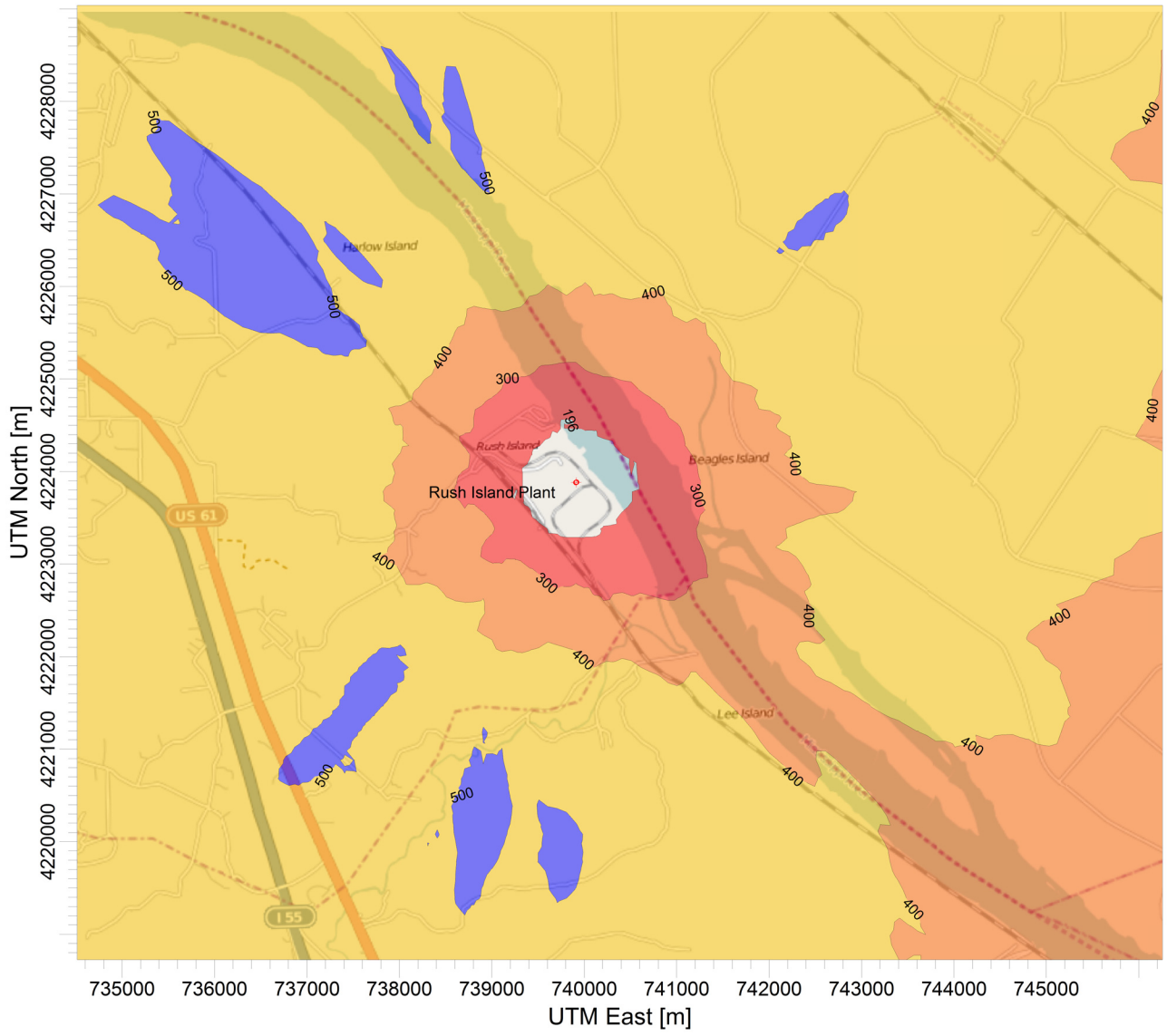
1-hour SO2 Concentrations (ug per cubic meter) - All colored areas exceed the NAAQS.

196 300 400 500

All concentrations include a background of 117.7 ug/m3.

Total Sources **4**	**Conducted on behalf of the Sierra Club**
Total Receptors **22083**	**by Wingra Engineering, S.C.**
Output Type **Concentration**	SCALE: 1:659,039 0 20 km
Maximum **538.0817 ug/m^3**	DATE: **1/24/2012**

Figure 2 - Local View - AmerenUE Rush Island Plant - Festus, Missouri
Evaluation of Compliance with the 1-hour NAAQS for SO2



1-hour SO2 Concentrations (ug per cubic meter) - All colored areas exceed the NAAQS.

196 300 400 500

All concentrations include a background of 117.7 ug/m3.	Total Sources **4**	**Conducted on behalf of the Sierra Club**	
	Total Receptors **22083**	**by Wingra Engineering, S.C.**	
	Output Type **Concentration**	SCALE: 1:73,812 0 2 km	
	Maximum **538.0817 ug/m^3**	DATE: **1/24/2012**	

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